

# EXHIBIT 6

US009749792C1

(12) **EX PARTE REEXAMINATION CERTIFICATE** (11984th)  
**United States Patent**  
**Klicpera**

(10) **Number:** **US 9,749,792 C1**(45) **Certificate Issued:** **\*Jan. 12, 2022**(54) **WATER USE MONITORING APPARATUS**(71) Applicant: **Michael Edward Klicpera**, La Jolla, CA (US)(72) Inventor: **Michael Edward Klicpera**, La Jolla, CA (US)(73) Assignee: **REIN TECH, INC.**, Cheyenne, WY (US)**Reexamination Request:**

No. 90/014,355, Aug. 5, 2019

**Reexamination Certificate for:**Patent No.: **9,749,792**Issued: **Aug. 29, 2017**Appl. No.: **14/596,460**Filed: **Jan. 14, 2015**

(\*) Notice: This patent is subject to a terminal disclaimer.

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 12/539,150, filed on Aug. 11, 2009, now Pat. No. 9,061,307, which is a continuation-in-part of application No. 13/776,963, filed on Feb. 26, 2013, now Pat. No. 9,297,150, which is a continuation-in-part of application No. 14/561,271, filed on Dec. 5, 2014, now Pat. No. 9,494,480.

(60) Provisional application No. 62/095,024, filed on Dec. 21, 2014.

(51) **Int. Cl.****H04W 4/021** (2018.01)**G06Q 50/06** (2012.01)**G01F 15/06** (2006.01)**E03B 7/07** (2006.01)**F16K 31/02** (2006.01)**H04M 1/72415** (2021.01)**F16K 31/05** (2006.01)**G01F 15/075** (2006.01)(52) **U.S. Cl.**CPC ..... **H04W 4/021** (2013.01); **E03B 7/071** (2013.01); **F16K 31/02** (2013.01); **F16K 31/05** (2013.01); **G01F 15/066** (2013.01); **G01F 15/0755** (2013.01); **G06Q 50/06** (2013.01); **H04M 1/72415** (2021.01)(58) **Field of Classification Search**CPC ..... D06F 39/00; G06F 3/00  
See application file for complete search history.

## (56)

**References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,355, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

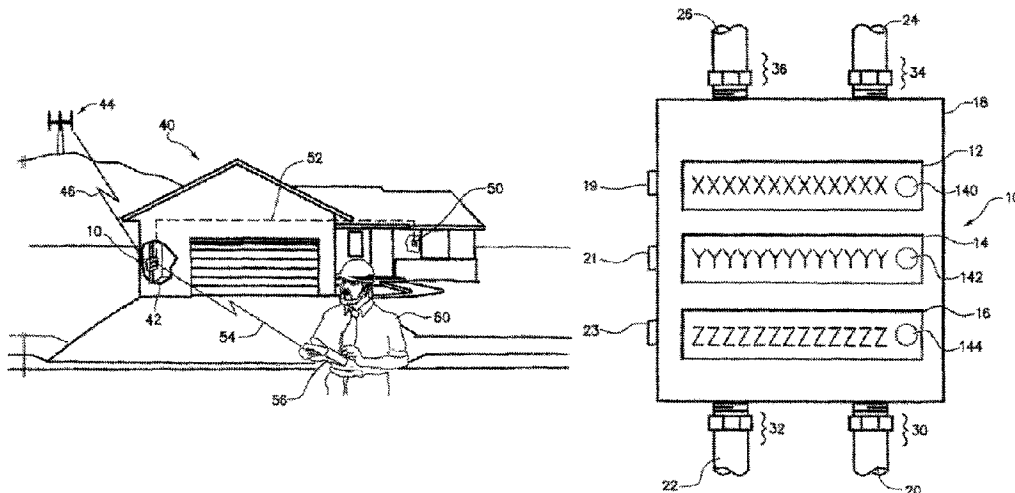
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## (57)

**ABSTRACT**

The present invention is a water use and/or a water energy use monitoring apparatus that is affixed to the hot and cold water supply piping for continuously (or on demand) monitoring displaying the water and water energy (hot vs. ambient) use within a residential or commercial building. The water use monitor apparatus includes a power generation, a microprocessor, temperature and water flow sensors, optional water quality sensors, timing circuits, wireless circuitry, and a display means. A wired or wireless means is designed to electronically communicate water use, water energy use and/or water quality information to a remotely located display apparatus or typical cell phone, smart phones, or similar apparatus for convenient observation by a commercial, operator or occupier, resident, municipal or government agency.

Attention is directed to the decision of IPR 2020-00100 of the Patent Trial and Appeal Board (Final Decision) relating to this patent. This reexamination may not have resolved all questions raised by this decision. See 37 CFR 1.552(c) for *ex parte* reexamination and 37 CFR 1.906(c) for *inter partes* reexamination.



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## EX PARTE

## REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS  
INDICATED BELOW.

**Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.**

ONLY THOSE PARAGRAPHS OF THE  
SPECIFICATION BY AMENDMENT ARE  
PRINTED HEREIN.

Column 1, lines 32-45:

Several municipalities are considering or have enacted water conservation laws or ordinances. For example, the city of San Diego, Calif. has considered enacting an ordinance requiring new multi-housing to include a secondary means for monitoring water use. Florida's Miami-Dade County Ordinance 08-14, effective on Jan. 1, 2009, [defined] *required* restricted toilet, urinals, faucet and shower head water flow. California Assembly Bill 715 phases in lower flush volume requirements for water closets and urinals. Texas House Bill 2667 mandates showerhead ratings of <2.5 gallons per [minutes] *minute* and urinal flush volumes <0.5 gallons per flush. Los Angeles, Calif.'s High Efficiency Plumbing Fixtures Ordinance contains requirements to install high efficiency water fixtures for all new buildings and renovations.

Column 1, line 59, to column 2, line 4:

The solid-state digital Smart Meter™ electric meter records hourly meter reads and periodically transmits [the reads] via a dedicated radio frequency (RF) network back to a defined municipality. Each SmartMeter™ electric meter equipped with a network radio, which transmits *electric* meter data to an electric network access point. The system uses RF mesh technology, which allows meters and other sensing devices to securely route data via nearby meters and relay devices, creating a "mesh" of network coverage. The system supports two-way communication between the meter and PG&E. SmartMeter™ electric meters can be upgraded remotely, providing the ability to implement future innovations easily and securely.

Column 2, lines 5-20:

The electric *meter* network access point collects meter data from nearby electric meter and periodically transfers this data to defined municipality via a secure cellular network. Each RF mesh-enabled device (meters, relays) is connected to several other mesh-enabled devices, which function as signal repeaters, relaying the data to an access point. The access point device aggregates, encrypts, and sends the data back to the defined municipality over a secure commercial third-party network. The resulting RF mesh network can span large distances and reliably transmit data over rough or difficult terrain. If [a] *an electric* meter or other transmitter drops out of the network, its neighbors find another route. The mesh continually optimizes routing to ensure information is passed from its source to its destination as quickly and efficiently as possible.

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Column 4, lines 21-26:

FIG. 2 is a front view of a water use and water energy use monitoring apparatus base station showing input hot and cold water [supplies] *supply* lines and output hot *water* and cold water supply lines with optional display means having one or more display screens and a plurality of hardware and/or software buttons.

Column 5, lines 4-5:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Column 5, lines 17-19:

Encryption refers to a privacy technology that prevents [anyone] *any individual* but the intended recipient(s) to download, review or read a confidential information, signal and/or data.

Column 5, lines 20-23:

Authentication refers to the technology that ensures that a message(s), data or control or information that is downloaded or transferred from one [person] *individual* or device, to another declared or intended [person] *individual* or device.

Column 5, lines 24-25:

Integrity refers to technology that ensures that a message, information, control command signal and/or data is not altered in any way, during [transit] *transmission*.

Column 5, lines 29-44:

Cellular technology refers to all current and future variants, revisions and generations (e.g. third generation (3G), fourth generation (4G), fifth generation (5G) and all future generations) of Global System for Mobile Communication (GSM), General Packet Radio Service [(GPRS)] (*GPRS*), Code Division Multiple Access (CDMA), Evolution-Data Optimized (EV-DO), Enhanced Data Rates for GSM Evolution (EDGE), 3GSM, Digital Enhanced Cordless Telecommunications (DECT), Digital AMPS OS-136/TDMA, Integrated Digital [Enhance] *Enhanced* Network (iDEN), HSPA+, WiMAX, LTE, Flash-OFDM, HIPERMAN Wifi, iBurst, UMTS, W-CDMA, HSPDA+HSUPA, UMTS-TDD and other formats for utilizing cell phone technology, antenna distributions and/or any combinations thereof, and including the use of satellite, microwave technology, the internet, cell tower, and/or telephone lines.

Column 6, lines 62-67 to column 7, lines 1-36:

Referring now to the drawings and particularly to FIG. 1 is a perspective view of the first embodiment comprising the [comprising the] water use monitoring display apparatus base station 10 affixed to the hot and cold (see second embodiment 126 in FIG. 6) water supply piping in an appropriate location for water monitoring and for continuously monitoring of the water and water energy use within a residential or commercial building 40. This can be useful for an individual or commercial operator (employing) *performing* water conservation methods (e.g. reduce the sprinkler frequency or duration, encourage individuals to take shorter showers, fix leaking devices). Alternately, the monitoring of indoor water use and outdoor water use could be

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utilized by the particular water supplying municipality or government agency to apply different rates for indoor water use and outdoor water use. In addition, since many municipal agencies include a sewer cost in a ratio of the total supply use, the difference between indoor water use and outdoor water use can [reduced] *reduce* the total sewer cost associated with only the indoor use, thus saving the consumer costs. In certain situations, a control valve can be located at a [particular] location, e.g. the irrigation valve or ball valve whereby by utilizing the two-way wireless capability of the present invention apparatus 10, 126 whereby the owner, water supplying municipality or government agency can remotely control water use (e.g. turn the main water supply off after a leaking notice, send out a code that inhibits outdoor water use on certain days or at certain hours of the day). For accurate measurements of water use or water energy use the present invention should be installed between the pressure reducing valve or civil, commercial, governmental or municipal supply water sources (with potential meter) and/or any distribution lines. It is also anticipated by the Applicant that present invention can be used on wells and in situations where the water source is not obtained from a commercial or municipal [operations] *operation*. The water use and water energy use monitoring apparatus base station 10, 126 can update, upload or download water and energy use on various frequencies, e.g. once per minute, once per hour, once per day, or can send information upon sensing the initiation of water use [(after no water use period)] *until water use is stopped (water use period)* on the display/recorder screen (shown in FIG. 2).

Column 7 lines 37-67 to column 8, lines 1-15:

Also shown in FIG. 1 is a first wired or wireless communication means 52 from the water use and water energy use monitoring apparatus base station 10, 126 for communicating water use and water energy use information or data to a conveniently located first display and/or recorder apparatus 50 (defined in more detail in FIG. 5) located in a convenient location for the commercial operator or occupier or residential individual to observe daily, weekly, monthly or annual water use. The water use and water energy use monitoring apparatus base station 10, 126 can be programmed to communicate at other time frequencies, such as every 5 seconds or every minute, for various purposes, for example, to identify leaking conditions. The first wireless communication means 52 preferably utilizes encryption, [authentic] *authentication*, integrity and non-repudiate techniques to provide a secure transfer of the water and energy use from the water/energy use from the monitoring base station apparatus 10, 126 to the first remote and/or recorder 50. The first wired or wireless communication means 52 can send data on various frequencies, e.g. once per minute, once per hour, once per day, or can send information upon sensing an initiation of a water use until water use is stopped (water use period) to the first remote and/or recorder 50 or atypical cell phone, smart phones, or other electronic apparatus (see FIG. 9). Furthermore, the first wired or wireless communication means 52 can send data or information upon the sending of a request signal. The request signal can be generated by, for example, the pushing of a requesting button located on the first remote display and/or recorder 50 that transmits a request for water and energy use data to the water and energy monitoring apparatus base station 10, 126. The use of the request signal can minimize the use of wireless signals within the house or commercial building, conserving energy, minimizing the interference with other

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wireless devices, and reduce the exposure of wireless energy to individuals. Furthermore, the first wireless communication means 52 can consist of two-way transmission, commonly known as transceiver technology, such that the monitoring display apparatus base station 10, 126 can transmit and receive electronic signals from the first display and/or recording apparatus 50 and similarly, and the first display and/or recording apparatus 50 can transmit and receive electronic signals from the monitoring display apparatus base station 10, 126. The first wired or wireless communication 52 can be either one-way transmission, or half duplex and/or full duplex two-way transmission.

Column 8, lines 16-67:

The second optional wireless communication means 54 is preferred to transit, upload or download water parameter data or information via a secure wireless communication network providing information to a governmental, civil or municipal employee or individual 60 using a second remote display and/or recorder apparatus 56 (or a typical cell phone, smart phones, or similar apparatus as shown in FIG. 9) for property owners, governmental, civil, commercial or municipal operators or agencies purposes. It is anticipated that the second wireless communication means 54 can also be received by a moving vehicle or can communicate with cellular format technology utilizing cell towers 44 using another third wireless communication 46. The second optional wireless communication means 54 preferably utilizes encryption, [authentic] *authentication* integrity and non-repudiate techniques to provide a secure transfer of the water and energy use from the water monitoring display base station JO, 126 to the second remote display and/or recorder apparatus 56. Also, the second wireless communication means 54 should include specific identification information e.g. house or commercial building address, IP address or other specific technology. The second optional wireless communication means 56 can send data on various frequencies, e.g. once per minute, once per hour, once per day, or can send information upon sensing an initiation of a water use until water use is stopped (water use period) to the second remote and/or recorder 56. The water use and water energy use monitoring apparatus base station 10, 126 can, be programmed to communicate at other time frequencies, such as every 5 seconds or every minute, for various purposes, for example, to identify leaking conditions. Furthermore, the second optional wireless 56 communication means can send data or information upon the sending of a request signal. The request signal can be generated by, for example, the pushing of a requesting button located on the second remote display 50 and/or recorder 56 that transmits a request for water and energy use data to the water and energy monitoring apparatus base station 10, 126. The use of the request signal can minimize the use of wireless signals within the house or commercial building, conserving energy, minimizing the interference with other wireless devices, and reduce the exposure of wireless energy to individuals. Furthermore, the second wireless communication means 54 can consist of two-way transmission, commonly known as transceiver technology, such that the monitoring display apparatus base station 10, 126 can transmit and receive electronic signals from the second optional display and/or recording apparatus 56 and similarly, and the second optional display and/or recording apparatus can transmit and receive electronic signals from the monitoring display apparatus base station 10, 126. Hence the first wired or wireless communication 52

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can be either one-way transmission, or half duplex and/or full duplex two-way transmission.

Column 9, lines 1-67 to column 10, lines 1-7:

The third, optional wireless communication means **46** is designed to communicate data under a cellular format technology with offsite central monitoring computer or cell, mobile or other telephone lines via satellite, microwave technology, the internet, cell tower, telephone lines, and the like. It is anticipated that the third wireless communication means **46** can transmit information to a programmed cell or phone number for communicating water parameter data or alarm situations to the owner or a municipal/governmental agency (such as announcing a water leak situation). Also, the third wireless communication means **46** should include specific identification information e.g. house or commercial building address, IP address or other specific technology. The third wireless communication means **46** can send data on various frequencies, e.g. once per minute, once per hour, once per day, or can send information upon sensing the initiation *of water use until water use is stopped (water use period) or upon an alarm situation* to the programmed cell or phone number. The water use and water energy use monitoring apparatus base station **10, 126** can be programmed to communicate at other time frequencies, such as every 5 seconds or every minute, for various purposes, for example, to identify leaking conditions. The request signal can be generated by, for example, a request signal transmitted by a remote station (not shown). The use of the request signal can minimize the use of wireless signals within the house or commercial building, conserving energy, minimizing the interference with other wireless devices, and reduce the exposure of wireless energy to individuals. Furthermore, the third wireless communication means **46** can consist of two-way transmission, commonly known as transceiver technology, such that the monitoring display apparatus base station **10, 126** can transmit and receive electronic signals from the remote station and similarly, the remote station can transmit and receive electronic signals from the water use and water energy use monitoring display apparatus base station **10, 126**. The third wireless means **46** can also be designed for communicating to an offsite central monitoring computer or cell, mobile or other telephone lines via satellite, microwave technology, the internet, cell tower, telephone lines, and the like. The third communication means **46** can also comprise a RF mesh-enabled water meter device *[meter, relays] is* connected to several other mesh-enabled devices, which function as signal repeaters, *or relaying data to an access point. The receiving station is cable of functioning as an access point to transfer data and information to and from the internet.* The access point device aggregates, encrypts, and *[send] transfers* the data *[back]* to a municipal or government agency over a secure commercial third-party network. The resulting RF mesh network can span large distances and reliably transmit the data *[over rough or difficult terrain]*. If a water meter or other transmitter drops out of the network, *[its neighbor find] it finds* another route. The mesh continually optimizes routing to ensure information is passed from its source to its destination as quickly and efficiently as possible. Furthermore, it is anticipated that the third wireless means can “piggy back” or be designed to be incorporated into and/or cooperation with electric and gas smart meters communication/transmission mesh technology. This takes advantage of the communication/transmission mesh means already in place thereby, minimizes cross talk and cross interference in wireless transmissions, and mini-

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mized overall wireless signals in residential or commercial area. The terminal communication/ transmission of water parameter data can *be* designed to be sent to a difference source, e.g. water municipality versus the electric or gas company. The third optional wireless communication can be either one-way transmission, or half duplex and/or full duplex two-way transmission. This third wireless technology **46** is designed for long range uses that can communicate with remote computers, for example, property owners, municipal and government uses, control, and billing practices. It is anticipated that the billing practices can be conducted by an independent corporate entity. This third wireless technology **46** can also be used to communicate with a home resident or corporate individual on their typical cell phone, smart phones, or similar apparatus **400** (see FIG. 9).

Column 12, lines 48-64:

Several different data formats *[that]* may be used to exchange data, including *[but not limited to: binary,] XML, XHTML and XHTML Basic, [XHTML Basic as an Info-set in another form besides tagged text, Binary encoded equivalents of XML] Info-sets including Wireless Binary XML (“WBXML”), ASN.1 encoded XML, SVG, Direct Internet Message Encapsulation (“DIME”), [CSV, XML RPC, SOAP] Simple Object Access Protocol (SOAP) (with signature at SOAP level and/or enclosed content level), SOAP (using WS-SECURITY with signature at SOAP level and/or enclosed content level), [application specific content like spreadsheet data, an] a HTTP response to an unsolicited HTTP request, a response to an unsolicited message, HHEF, PQDIF, MODBUS, ION.RTM., or other SCADA protocol where a response can be packaged up and embedded in another protocol or format. These formats are frequently sent as MIME or UUENCODE attachments and are considered part of the protocol stack.*

Column 12, lines 65-67 to column 13, lines 1-2:

The water use and water energy use monitoring apparatus **10, 126** activities will require security due to economic impact or violation of municipal or governmental law and ordinances or fraudulent activities. *[SPOT is a technology that uses the FM band and is coupled with a new digital radio infrastructure.]*

Column 16, line 37-62:

Software may be designed to check for valid signatures before an upload is attempted, and only allow certain users to upload unverified firmware. The firmware itself may verify signatures to ensure firmware has not been tampered with and is from an authorized source, and that the entity attempting the upgrade is authorized to perform an upgrade. Third parties may upload their own firmware written in their language of choice, such as Java, Pro log, Haskell, binary executable code, *or C#, ECMA Common Language Runtime [“ECMA CLR”], or ION® Object Configurations.* Depending on the platform, source code or some repurposed version of the source code *[i.e. ECMA CLR or target processor machine code]* is digitally signed by the party and uploaded. Such code would be allowed to perform only specific actions based on trust level of the signer. For example, unsigned code or code signed by a non-trusted entity will not be allowed to read the second wireless communication mean **54** or the third wireless communica-

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tion means **46**. In [additional] *addition*, the water use and water energy monitoring base station **10**, **126** or the first remote display and/or recording means **50** could have a microprocessor that includes a data memory bank for [are calling] *recording* the water and/or energy use parameter data which can be compared with the data that is uploaded by the government or municipal second remote display/recorded means **56** or the data that is uploaded by the wireless cellular format communication means **46** [remote states].

Column 17, lines 5-48:

As shown in FIG. 1 but applicable to FIG. 6, is a first wired or wireless communication means **52** from the water use and water energy use towing apparatus base station **126** for communicating water use information or data to a conveniently located first remote display and/or recorder apparatus **50** (defined in more detail in FIG. 5) located in a convenient location for the commercial operator or occupier or residential individual to observe daily, weekly, monthly or annual water use. The first remote display and/or recorded apparatus **50** can be a typical cell phone, smart phone, or similar apparatus (see FIG. 9) that is using wireless, Bluetooth technology or other wireless technology. The first wireless communication means **52** preferably utilizes some confidential technology such as encryption, [authentic] authentication, integrity and non-repudiate techniques to provide a secure transfer of the water use from the monitoring base station apparatus **10**, **126** to the first remote display and/or recording apparatus **50**. The first wired or wireless communication means **52** can send data on various frequencies, e.g. once per minute, once per hour, once per day, once per week, one per month/year or can send information upon sensing an initiation of water use until water user is stopped (water use period) to the first remote and/or recording apparatus **50**. Furthermore, the first wired or wireless communication means **52** can send data or information upon the sending of a request signal. The request signal can be generated by, for example, the pushing of a requesting button located on the first remote display and/or recording apparatus **50** that transmits a request for water use data to the water and water energy monitoring apparatus base station **10**, **126**. The use of the request signal can minimize the use of wireless signals within the house or commercial building, conserving energy, minimizing the interference with other wireless devices[,] and reduce the exposure of wireless energy to individuals. Furthermore, the first wireless communication means **52** can consist of two-way transmission, commonly known as transceiver technology, such that the monitoring display apparatus base station **126** can transmit and receive electronic signals from the first display and/or recording apparatus **50** and similarly, and the first display and/or recording apparatus **50** can transmit and receive electronic signals from the monitoring [display apparatus] base station **10**, **126**. Hence, the first wired or wireless communication **52** can be either one-way transmission, or half duplex and/or full duplex two-way transmission.

Column 17, lines 49-67, to column 18, lines 1-30:

As shown in FIG. 1 but applicable to FIG. 6, the second optional wireless communication **54** is preferred to transmit, upload or download water parameter data or information via a secure wireless communication network providing information to a property owner, governmental, civil or municipal

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pal employee or individual **60** using a second remote display and/or recorder apparatus **56** for governmental, civil, commercial or municipal operators or agencies purposes. It is anticipated that the second wireless communication means **54** can also be received by a moving vehicle or can communicate with cellular format technology utilizing cell towers **44** using another third wireless communication **46**. The second optional wireless communication means **54** preferably utilizes some confidential technology such as encryption, [authentic,] authentication, integrity and non-repudiate techniques to provide a secure transfer of the water use from the monitoring base station apparatus **126** to a second display and/or recorder **56**. The second display and/or recorded can be a typical cell phone, smart phone, or similar apparatus (see FIG. 9) that is using wireless, Bluetooth technology or other wireless technology. Also, the second wireless communication mean **54** should include specific identification information e.g. house or commercial building address, IP address or a similar unique technology. The second optional wireless **56** communication means can send data on various frequencies e.g. once per minute, once per hour, once per day, or can send information upon sensing an initiation of water use until water use is stopped (water user period) to the second remote and/or recorder **56**. Furthermore, the second optional wireless communication means **56** can send data or information upon the sending of a request signal. The request signal can be generated by, for example, the pushing of a requesting button located on the second remote display and/or recorder **56** that transmits a request for water use data to the water and energy monitoring apparatus base station **126**. The use of the request signal can minimize the use of wireless signals within the house or commercial building, conserving energy, minimizing the interference with other wireless devices, and reduce the exposure of wireless energy to individuals. Furthermore, the second wireless communication means **54** can consist of two-way transmission, commonly known as transceiver technology, such that the monitoring display apparatus base station **126** can transmit and receive electronic signals from the second display and/or recording apparatus **56** and similarly, and the second display and/or recording apparatus **56** can transmit and receive electronic signals from the monitoring display apparatus base station **10**, **126**. Hence, the first wired or wireless communication **52** can be either one-way transmission, or half duplex and/or full duplex two-way transmission.

Column 18, lines 31-67 to column 19, lines 1-18:

As shown in FIG. 1 but applicable to FIGS. 5, 6, and 9, is the third optional wireless communication means **46** is designed to communicate data under a cellular format technology with offsite central monitoring computer or cell, mobile or other telephone lines via satellite, microwave technology, the internet, cell tower, telephone lines, and the like. It is anticipated that the third wireless communication means **46** can transmit information to a programmed cell or phone number for communicating water parameter data or alarm situations to the property owner or a municipal/governmental agency (such as announcing a water leak situation). The information can be [send] sent to a typical cell phone, smart phone, or similar apparatus (see FIG. 9). Also, the third wireless communication means **46** should include specific identification information e.g. house or commercial building address, IP address or similar unique technology. The third wireless communication means **46** can send data on various frequencies, e.g. once per minute, once

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per hour, once per day, once per week, once per month/year or can send information upon sensing the initiation [(alarm situation)] *of a water use until water use is stopped (water use period) or upon an alarm situation* to the programmed cell or phone number. The request signal can be generated by, for example, a request signal transmitted by a remote station (not shown). The use of the request signal can minimize the use of wireless signals within the house or commercial building, conserving energy, minimizing the interference with other wireless devices, and reduce the exposure of wireless energy to individuals. Furthermore, the third wireless communication means 46 can consist of two-way transmission, commonly known as transceiver technology, such that the monitoring display apparatus base station 126 can transmit and receive electronic signals from the remote station and similarly, the remote station can transmit and receive electronic signals from the water use and water energy use monitoring display apparatus base station 126. The third wireless means 46 can also be designed for communicating to an offsite central monitoring computer or cell, mobile or other telephone lines via satellite, microwave technology, the internet, cell tower, telephone lines, and the like. The third communication means 46 can also comprise a RF mesh-enabled [device (meters, relays)] *water meter that* is connected to several other mesh-enabled devices, which function as signal repeaters, relaying the data to an access point. The access point device aggregates, encrypts, and sends the data [back] to a municipal or government agency over a secure commercial third-party network. The resulting [RF] mesh network can span large distances and reliably transmit the data [over rough or difficult terrain]. If a *water meter* or other transmitter drops out of the network, [its neighbor find] *it finds* another route. The mesh *technology* continually optimizes routing to ensure information is passed from its source to its destination as [quickly and] efficiently as possible. Hence, the first wired or wireless communication 52 can be either one-way transmission, or half duplex and/or full duplex two-way transmission.

Column 23, lines 7-35:

In addition, the water use monitoring display apparatus 10, 126 can include water [shut off means] *control valve* or a variable water flow means to turn off the water supply if an alarm condition or setting point is exceeded and has been activated. The water shut off means is electrically connected to the CPU or microprocessor 84 and the power means thereby controlling the application of electrical power to activate or deactivate the water shut off means. The water [shut off means] *control valve mechanism* can comprise, for example, a typical ball valve or solenoid shut off valve incorporate into the connection union such that water from the source is closed such that no water exits the shower or bath water head. The water [shut off means] *control valve mechanism* can be activated if an alarm state has been achieved, e.g. 200 gals/day of water is exceeded or the total of 15 gallons of water has flowed since the water sources was closed. The alarm settings can be a default setting installed by the manufacturer or programmed by the user. The water shut off means can be activated by software instructions[,] initiated by a command communicated over the optional second 54 and third 46 wireless means. As an example, many irrigation manufactures (Orbit, Hunter irrigation products) incorporate battery control valves and there

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are numerous other flow valve using standard electrical energy are available, e.g. ball valves, gate valves, butterfly valves.

Column 25, lines 48-52:

Technological progress allows for more [and more] *sensors* to be manufactured on the microscopic scale as micro-sensors using MEMS technology. In most cases a micro-sensor reaches a significantly higher speed and sensitivity compared with macroscopic approaches.

Column 25, lines 53-64:

There are many types of sensors that can be used with the present invention. Since a significant small change involves an exchange of energy, sensors can be classified according to the type of energy transfer that they detect. For measuring or monitoring the temperature of the water flowing [from the shower or bath head,] *through the water meter* the use of various thermocouples or thermistor sensors 70 as depicted in FIG. 3 is protruding within the water supply lumen 38 (or in close proximity to the water to be measured) and mounted within the articulating joint mechanism 22. Wires 71 are shown extending from the sensor 70 to electronically communicate with the CPU or microprocessor 84 and display unit.

Column 25, lines 65-67, to column 1-17:

[In 1821, the German-Estonian physicist Thomas Johann Seebeck] *It has been previously* discovered that when any conductor (such as a metal) is subjected to a thermal gradient, it will generate a voltage. [This is now known as the thermoelectric effect or Seebeck effect.] Any attempt to measure this voltage necessarily involves connecting another conductor to the "hot" end. This additional conductor will then also experience the temperature gradient[,] and develop a voltage of its own which will oppose the original. Fortunately, the magnitude of the effect depends on the metal in use. Using a dissimilar metal to complete the circuit will have a different voltage generated, leaving a small difference voltage available for measurement, which increases with temperature. This difference can typically be between 1 and 70 micro-volts per degree Celsius for the modern range of available in metal combinations. Certain combinations have become popular as industry standards, driven by cost, availability convenience, melting points, chemical properties, stability, and output.

Column 28, lines 13-18:

A thermistor is a type of resistor used to measure temperature changes, relying on the change in its resistance with changing temperature. [Thermistor is a combination of time words thermal and resistor. The thermistor was invented by Samuel Ruben in 1930, and was disclosed in U.S. Pat. No. 2,021,491.]

Column 28, lines 19-27:

If we assume that the relationship between resistance [amid] and temperature is a linear *response* (i.e. we make a first-order approximation), then [we can say that] *the formula is:*

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 $\Delta R = K \Delta T$ 

Where:

 $\Delta R$  represents the change in resistance $\Delta T$  [= $\Delta$ ] represents the change in temperature[k=]  $\Delta K$  represents the first-order temperature coefficient of resistance.

Column 28, line 44-50:

It is anticipated by the Applicant that various types of thermocouples or thermistors can be used for the present invention. It is not important what type of thermocouple or thermistor is utilized for monitoring or measuring the temperature of the water entering the [shower head, bath head or] water supply lines except that it is accurate for the appropriate temperature range monitored or measured.

Column 28, lines 51-58:

In order to monitor or measure the flow rate of the water being delivered by the water supply line various flow measuring technologies are applicable to the present invention. For measuring or monitoring the rate of the water flowing through the [shower or bath head, the use of various venturi type] flow sensors or pressure sensors 74 as depicted in FIG. 4 are positioned in close proximity to the water source to be measured.

Column 28, lines 59-67 to column 29, lines 1-5:

One means to monitor flow parameter is to create a venturi, which constricts the flow in some fashion, and measure the differential pressure that results across the constriction. This method is widely used to measure flow rate in the transmission of gas or liquids through pipelines [and has been used since Roman Empire times.] The venturi effect is all example of Bernoulli's principle, [in the case of] wherein incompressible fluid [flow] flows through a tube or pipe with a constriction in it. The fluid velocity must increase through the constriction to satisfy the equation [of continuity.] while its pressure must decrease due to conservation of energy [the gain in kinetic energy is supplied by a drop] in pressure or a pressure gradient force. [The effect is named after Giovanni Battista Venturi, (1746-1822), an Italian physicist.]

Column 29, lines 13-25:

In addition, the flow sensor 74 can be fabricated from pressure sensor technology. [Pressure sensors are used in numerous ways for control and monitoring in thousands of everyday applications.] Pressure sensors can be used in systems to measure other variables such as fluid/gas flow, speed, water level, and altitude. Pressure sensors can alternatively be called pressure transducers, pressure transmitters, pressure senders or pressure indicators [among other names].

Column 30, lines 4-13:

[Piston Meter-Due to the fact that they used for domestic water measurement.] Piston meters, (also known as Rotary Piston, or Semi-Positive displacement meters) are the most common in the UK and are used for almost all meter sizes up and including 40 mm (1½"). The piston meter operates on the principle of a piston rotating within a chamber of known volume. For each rotation, an amount of water passes

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through the piston chamber. Through a gear mechanism and, sometimes a magnetic drive, a needle dial and odometer type display is advanced.

Column 30, lines 14-17:

[Woltmann meter—] Woltmann meters, commonly referred to as Helix meter are popular at larger sizes. Jet meter (or single car Multi-Jet) are increasing in popularity in the UK [at larger sizes and are commonplace in the EU.]

Column 30, lines 18-19:

The Dall Tube[—] is [A] a shortened form of the Venturi [Lower] having a lower pressure drop than an orifice plate. Remarks: These amendments make grammatical or clarifying corrections. Support for these amendments is found in this paragraph.

Column 30, lines 20-24:

[Orifice Plate—] Another simple method of measurement using an orifice plate, which is basically a plate with a hole through it. It is placed in the flow and constricts the flow. It uses the same principle as the venturi meter in that the differential pressure relates to the velocity of the fluid flow [Bernoulli's principle].

Column 30, lines 26-32:

[Pitot tube—] Measurement of the pressure with a pitot tube in the flowing fluid, or the cooling or a heated element by the passing fluid are two other methods that are used. These types of sensors are advantage in that they are rugged, so not easily damaged in extreme environment. A pitot tube is a L shaped tube which is also able to measure fluid flow.

Column 30, lines 33-36:

[Paddle wheel—] The paddle wheel translates the mechanical action of paddles rotating in the liquid flow around an axis into a user-readable rate of flow (gpm, lpm, etc.). The paddle tends to be inserted into the water flow.

Column 30, lines 37-41:

[The Pelton wheel—] The Pelton wheel turbine (better described as a radial turbine) translates the mechanical action of the Pelton wheel rotating in the liquid flow around an axis into [a] an user-readable rate of flow (gpm, lpm, etc.). The Pelton wheel tends to have all the water flow travelling around it.

Column 30, lines 42-46:

[Turbine flow meter—] The turbine flowmeter (better described as an axial turbine) translates the mechanical action of the turbine rotating in the liquid flow around an axis into a user-readable rate of flow (gpm, lpm, etc.). The turbine tends to have all the water flow travelling around it.

Column 30, lines 47-54:

[Thermal mass flow meters—] Thermal mass flow meters generally use one or more heated elements to measure the mass flow of gas. They provide a direct mass flow readout, and do not need any additional pressure temperature com-

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compensation over their specified range. Thermal mass flow meters are used for compressed air, nitrogen, helium, argon, oxygen, natural gas. In fact, most gases can be measured as long as they are fairly clean and non-corrosive.

Column 30, lines 55-67 to column 31, lines 1-5:

[Vortex flowmeters—] Another method of flow measurement involves placing an object (called a shedder bar) in the path of the fluid. As the fluid passes this bar, disturbances in the flow called vortices are created. The vortices trail behind the cylinder in two rolls, alternatively from the top or the bottom of the cylinder. [This vortex trail is called the Von Kármán vortex street after von Karman's 1912 mathematical description of the phenomenon.] The speed at which these vortices are created is proportional to the flow rate of the fluid. Inside the shedder bar is a piezoelectric crystal, which produces a small, but measurable, voltage pulse every time a vortex is created. The frequency of this voltage pulse is also proportional to the fluid flow rate[,] and is measured by the flowmeter electronics. [With  $f=SV/L$  where,  $f$ =the frequency of the vortices  $L$ =the characteristic length of the bluff body  $V$ =the velocity of the flow over the bluff body  $S$ =Strouhal Number and is a constant or a given body shape.]

Column 31, lines 6-21:

In addition, various magnetic[,] and ultrasound [and Coriolis] flow meters can be utilized with the present invention to function as the flow sensor 74. [Modern innovations] *Innovations* in the measurement of flow rate incorporate *modern* electronic [devices] *circuitry* that can correct for varying pressure and temperature, (i.e. density) conditions, non-linearities, and for the characteristics of the fluid. [The most common flow meter apart from the mechanical flow meters, is the] *The* magnetic flow meter [, commonly referred to as a "mag meter" or an "electromag". A] *utilizes* a magnetic field [is] applied to the metering tube, which results in a potential difference proportional to the flow velocity perpendicular to the flux lines. The physical principle [at work is], *follows* Faraday's law of electromagnetic induction. The magnetic flow meter requires a conducting fluid, e.g. water, and an electrical insulating pipe surface, e.g. a rubber lined non-magnetic steel tube.

Column 31, lines 22-38:

[Ultrasonic flow meters—] *The* ultrasonic flow meters *can* measure the difference of the transit time of ultrasonic pulses propagating in and against flow direction. This time difference is [measure] *measured* for the average velocity of the fluid along the path of the ultrasonic beam. By using the absolute transit times both the averaged fluid velocity and the speed of sound can be calculated. Using the two transit times  $t_{up}$  and  $t_{down}$  and the distance between receiving and transmitting transducers  $L$  and the inclination angle  $\alpha$  one can write the equation:

$$V = \frac{L}{2\sin(\alpha)} \frac{t_{up} - t_{down}}{t_{up}t_{down}} \text{ and } c = \frac{L}{2} \frac{t_{up} + t_{down}}{t_{up}t_{down}}$$

Where  $v$  is the average velocity of the fluid along the sound path and  $c$  is the speed of sound.

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Column 31, lines 39-52:

Measurement of the doppler shift resulting in reflecting ultrasonic beam off the flowing fluid is another [recent] innovation made possible by *modern* electronics. By passing an ultrasonic beam through a water pipe, bouncing it off of a reflective plate then revealing the direction of the beam, and repeating the measurement *such that* the water flow can be estimated. The speed of transmission is affected by the movement of water in a supply line and by comparing the time taken to complete the cycle upstream versus downstream the flow of water through the water pipe can be measured. A wide-beam sensor can also be used to measure flow independent the cross-sectional area of the water supply pipe.

Column 31, lines 53-60:

[Coriolis flow meters—] Using the Coriolis effect causes a laterally vibrating tube to distort, a direct measurement of mass flow can be obtained in a Coriolis flow meter. [Furthermore] *In this way*, a direct measure of the density of the fluid is obtained. Coriolis measurement can be very accurate irrespective of the type of gas or liquid that is measured; the same measurement tube can be used for hydrogen gas and peanut butter without recalibration.

Column 31, lines 61-67 to column 32, lines 1-9:

[Laser-doppler flow meter—] Fluid flow can be measured through the use of a monochromatic laser diode. The laser probe is inserted into a water pipe and turned on, where the *laser* light scatters and a [small] portion *that* is reflected back to the probe. The signal is then processed to calculate flow within the water pipe. There are limitations to the use of a laser doppler probe; flow within a water pipe is dependent on volume illuminated, which is often assumed rather than measured and varies with the optical properties of the [tissue] *water pipe*. In addition, variations in the type and placement of the probe within type and placement of the probe within identical water pipes *may* result in variations in reading. The laser doppler has the advantage of sampling a small volume of water, allowing for great precision, but does not necessarily represent the flow within an entire water system. The flow meter *using the laser diode* is more useful for relative rather than absolute measurements.

Column 35, lines 49-67 to column 36, lines 1-30:

In addition, as shown in FIG. 4, is an optional [Total Dissolved Solids] *total dissolved solids* (TDS) sensor 78 measures are the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water, expressed in units of mg per unit volume of water (mg/L), also referred to as parts per million (ppm). TDS is [directly] related to the purity [of water] and the quality of water. purification systems and affects everything that consumes, lives in, or uses water, whether organic or inorganic, whether for better or for worse. Dissolved solids refer to any minerals, salts, metals, cations, or anions dissolved in water. This includes anything present in water other than the pure water (H2O) molecule and suspended solids. [Suspended solids are any particles/substances that are neither dissolved nor settled in the water, such as wood pulp.] In general, the total dissolved solids concentration is the sum of the cations (positively charged) and anions (negatively charged) ions in the water. [Parts per Million (ppm) is the weight-to-weight ratio of any ion to water.] A

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TDS sensor or meter is based on the electrical conductivity (EC) of water and can be a relatively simple conductivity meter. Pure [H<sub>2</sub>O] water has virtually zero conductivity. Conductivity is [usually about] generally 100 times the total cations or anions expressed as equivalents. TDS is calculated by converting [the EC by] a factor of 0.5 to 1.0 times the EC, depending upon the levels. Typically, the higher the level of EC, the higher the 10 conversion factor to determine the TDS.] TDS comes from many organic sources such as leaves, silt, [plankton, and industrial waste and sewage. Other sources come from] runoff from urban areas, road salts [used on street during the winter,] and fertilizers and pesticides used on lawns and farms. Dissolved solids also come], from numerous inorganic materials such as rocks, and air that may contain calcium bicarbonate, nitrogen, iron 15 phosphorous, sulfur, and other minerals. Many of these materials form salts, which are compounds that contain both a metal and a nonmetal. Salts usually dissolve in water forming ions. Ions are particles that have a positive or negative charge. Water may also pick up metals such as lead or copper as they travel through pipes used to distribute water to consumers. [Note that the efficacy of water purification systems in removing total dissolved solids will be reduced over time, so it is highly recommended to monitor the quality of a filter or membrane and replace them when required.] The sensor 78 communicates with the water use and water energy use monitoring display apparatus base station apparatus 10, 126 through wired 79 (or wireless means) which includes specific software instructions to display the TDS parameter on one of the displays and provide an alarm that is programmed that is triggered when [an] a certain level or percentage is exceeded.

Column 36, lines 31-42:

[The] Current EPA [Secondary Regulations] regulations advise a maximum contamination Level [(MCL)] of 500 mg/liter [(500 parts per million (ppm)) for TDS] which is equivalent to 500 parts per million. [Numerous water supplies exceed this level.] When TDS levels exceed 1000 mg/L it is generally considered unfit for human consumption. A high level of TDS is an indicator of potential concerns, and warrants further investigation. Most often, high levels of TDS are caused by the presence of potassium, chlorides, and sodium ions. These ions have little or no short-term effects, but toxic ions (lead arsenic, and cadmium, nitrate and others) may also be dissolved in the water. Remarks: These amendments make grammatical or clarifying corrections. Support for these amendments is found in this paragraph.

Column 36, lines 60-67 to column 37, lines 1-55:

In addition, as shown in FIG. 4, is a biological or fecal coliform (bacteria) sensor 132. In general, increased levels of fecal coliforms provide a warning of failure water treatment, a break in the integrity of the distribution system, or possible contamination with pathogens. When levels are high there may be an elevated risk of waterborne diseases or [gastroenteritis] gastroenteritis. The presence of fecal coliform in water system may indicate that the water has been contaminated with the fecal material of humans or other animals. [Fecal] Contamination from coliform bacteria can [enter rivers or storm drains] be sourced through direct discharge of waste from mammals and birds, from agricultural [and storm] runoff, and from human sewage. Failing home septic systems can allow coliforms in the effluent to flow into the water table, aquifers, drainage ditches and

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nearby surface waters and can contaminate wells or water systems. [Sewage] Some older industrial cities sewage connections [that] are connected to storm drains pipes that can [also] allow human sewage into surface waters. [Some older industrial cities, particularly in the Northeast and Midwest of the United States, use a combined sewer system to handle waste. A combined sewer carries both domestic sewage and stormwater.] During high rainfall periods, a combined sewer drain can become over-loaded and overflow to a nearby stream or river, bypassing treatments. [Pets] In addition, pets can contribute to fecal contamination of surface waters. Runoff from roads, parking lots, and yards can carry animal wastes to streams through storm sewers. Birds can be a significant source of fecal coliform bacteria. Agricultural practices such as allowing livestock to graze near atherbodies, spreading manure as fertilizer on fields during dry periods, using sewage sludge biosolids and allowing livestock watering in streams can all contribute to fecal coliform contamination. Some waterborne pathogenic diseases that may coincide with fecal coliform contamination include ear infections, dysentery, typhoid fever, viral and bacterial gastroenteritis, and hepatitis A and C. [Reduction] Current treatments for the reduction of fecal coliform in wastewater may require the use of chlorine and other disinfectant chemicals. Such materials may kill the fecal coliform and disease bacteria. However, [They] they also kill bacteria essential to the proper balance of the aquatic environment, endangering the survival of species dependent on those bacteria. So higher levels of fecal coliform require higher levels of chlorine, threatening those aquatic organisms. Municipalities that maintain a public water supply will typically monitor and treat for fecal coliforms. [In waters of the U.S, Canada and other countries, water quality is monitored to protect the health of the general public. In the U.S., fecal coliform testing is one of the nine tests of water quality that form the overall water-quality rating in a process used by U.S. EPA.] However, in certain situations, such as septic systems, wells, and cross-contamination in plumbing distal to the site where water quality is tested, provides a risk. [The fecal coliform assay should only be used to assess the presence of fecal matter in situations where fecal coliforms of non-fecal origin are not commonly encountered. EPA has approved a number of different methods to analyze samples for bacteria.] The sensor 132 communicates with the water use and water energy use monitoring display apparatus base station apparatus 10, 126 50 through wired 133 (or wireless means) which includes specific software instructions to display the fecal coliform parameter on one of the displays or provide an alarm that is programmed that is triggered when [an] a certain level or percentage is exceeded.

Column 38, lines 4-54:

In [additional] addition, as shown in FIG. 4, is an optional water hardness sensor 136. [As pure water a good] Water is an excellent solvent and easily picks up impurities [easily and is often called the universal solvent. When water is combined] Water combines with carbon dioxide to form very weak carbonic acid and has even better solvent [results] characteristics. As water moves through soil and rock, it dissolves very small amounts of minerals [and holds them in] creating a solution [Calcium and] of magnesium and calcium, dissolved in water are the two most common minerals that make water "hard." The degree of hardness becomes greater as the calcium and magnesium content increases and is related to the concentration of multivalent cations dissolved in the water. Hard water interferes with

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[almost every] cleaning [task from] *tasks including* laundering [and] , dishwashing [to] , bathing, and personal grooming [Clothes laundered in hard water may look dingy and feel harsh and scratchy. Dishes and glasses may be spotted when dry.] Hard water may cause a film on glass shower doors, shower walls, bathtubs, sinks, faucets, etc. [Hair washed in hard water may feel sticky and look dull.] Water flow may be reduced by *mineral* deposits in pipes. [Dealing with hard water problems in the home can be a nuisance.] The amount of hardness minerals in water *also* affects the amount of soap and detergent necessary for cleaning. Soap used in hard water is less effective as it combines with [the] minerals to form a [sticky soap] soapy curd. [Some] *Similarly*, synthetic detergents are less effective in hard water because the active ingredient is partially inactivated by hardness[ even though it stays dissolved]. Bathing with soap in hard water leaves a film of sticky soap curd on the skin. [The film may prevent removal of soil and bacteria. Soap curd interferes with, the turn of skin to its normal, slightly acid condition, and may lead to irritation.] Soap curd on hair may make it dull, lifeless, and difficult to manage. When doing laundry in hard water, soap curds lodge in fabric during washing to make fabric stiff and rough. [Incomplete] *This results in incomplete* soil removal from laundry [causes] *causing* graying of white fabric and the loss of brightness in colors. [A sour odor can develop in clothes. Continuous laundering in hard water can shorten the life of clothes.] In addition, soap curds can deposit on dishes, bathtubs and showers, and all water fixtures. Hard water also contributes to inefficient and costly operation of water-using appliances. Heated hard water forms a scale of calcium and magnesium minerals that can contribute to the inefficient operation or failure of water-using appliances. Pipes can become clogged with scale that reduces water flow and ultimately requires pipe replacement.

Column 43, lines 37-45:

The present invention can also use RF mesh technology, which allows *water* meters and other [sensing devices] *receiving* to securely route data [via] *to* nearby meters and relay devices, creating a “mesh” of network coverage. The system supports two-way *or full duplex* communication between the water use and water energy use monitoring display apparatus base station 10 (and 126 in FIG. 6) and the remotely positioned display and/or recorder receiver apparatus 50, 56 and can be [upgraded] *remotely uploaded*, providing the ability to implement future innovations efficiently [easily and securely].

Column 43, lines 46-60:

The [electric] *water meter* network access point collects data and [periodically] transfers this data to defined municipality via a secure cellular network. Each RF mesh-enabled [device (meters, relays) is] *water meter and relay devices* are connected to several other mesh-enabled devices, which function as signal repeaters, [relaying] *transferring* the data [so] to an access point. The access point device aggregates, encrypts, and [sends] *transfers* the data [back] to municipality or governmental agency over a secure commercial third-party network. The resulting RF mesh network can [span large] *extend over long distances and reliably transmit data [over rough or difficult terrain]*. If a water meter or other transmitter drops out of the network, [its neighbors find] *it finds* another route. The mesh [continually] *technology* optimizes routing to ensure *data and information [is passed]*

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*transferred* from its source to its destination [as quickly and] *occurs* efficiently [as possible].

Column 50, lines 18-32:

Referring to FIG. 9B which shows one or more visual signals 409, 411 (e.g. LED or LCD) lights that are turned on (and off after a period of time) to communicate to an individual that the water use and water energy use monitoring display apparatus base station 10, 126 has completed the programmed activity (*soft button 403 remotely turns off the water supply and soft button 404 remotely turns on the water supply*). For example only, 409 could be a red LED light that illuminates when the water system turned off and 411 could be a green LED light that illuminates when the water system is turned on. This could be useful when a water leak alarm is communicated to the typical cell phone, smart phot or similar apparatus 400. it is anticipated by the Applicant that verbal signal (verbal “water off” or verbal “water on” or simply a playing certain ringtones) can also be used to communicate that the programmed activity has been completed. *Also shown is a schedule 407 with soft button 415 for program user defined schedules.*

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims 1-5, 12, 14, 17, 19, 22, 23 and 27 were previously cancelled.

Claims 6-11, 13, 15, 16, 18, 20-21, 24-26 and 28-34 are cancelled.

New claims 35-81 are added and determined to be patentable.

35. *A residential or commercial building or structure water meter system comprising:*

*a base station comprising therein a water control valve mechanism, said base station interposed between a main water line and a water supply for said building or structure water system;*

*said base station further comprising:*

*a) An electrical circuitry comprising at least one of a CPU, microprocessor and microcontroller;*

*b) said at least one of a CPU, microprocessor and microcontroller comprising an integrated memory bank or memory bank located as a separate memory module;*

*c) said power source comprising at least one of an AC power source, DC power source, and one or more standard or rechargeable batteries that are electrically connected to said electrical circuitry;*

*d) at least one of a CPU, microprocessor and microcontroller can be used to monitor at least one of a water use data, water duration, and water total volume;*

*e) the water control valve mechanism is at least one of an on/off valve, a variable water flow mechanism, or a three-way valve mechanism, the water control valve mechanism in electrical communication with said electrical circuitry;*

*f) one or more water flow rate sensors in communication with said water supply and electrically connected with said electrical circuitry; and*

*g) one or more wireless communication technologies utilizing confidential communication technology for communication with at least one of a private, com-*

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mercial, and third-party networks and further to a remote central computer or cloud service provider; the confidential communication technology comprising at least one of an encryption, authentication, integrity, and non-repudiation technology which originates from the base station;

at least one of a cell phone or smart phone, web portal, computer, and one or more other electronic communication devices having a user interface utilizing a software program application that facilitates communication between said base station and said remote central computer or cloud service provider; and

said program application being configured to provide a user interface capable of displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said base station;

wherein said user interface is capable of performing at least one of the functions of:

providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said base station memory bank, said remote central computer and the cloud service provider;

turning on or off the water supply by sending a command signal transferred to the base station;

showing or modifying a program, setting or a default menu incorporated with the base station;

specifying the water control valve mechanism position by sending a request to the base station; and

programming a vacation or work water schedule into the base station.

36. A residential or commercial building or structure water meter system as recited in claim 35, wherein the one or more other remote electronic communication devices including at least one of a PDA tablet, computer, a smart or internet capable television, wireless watch and other electronic apparatuses with Wi-Fi and wireless capability.

37. A residential or commercial building or structure water meter system as recited in claim 35, wherein said water control valve mechanism or a variable water flow mechanism is programmed to automatically turn off the main water supply when a leak is detected.

38. A residential or commercial building or structure water meter system as recited in claim 35, wherein said one or more water flow rate sensors includes independent flow sensors with wireless transceivers or at least one of the main water supply, an irrigation water supply, one or more showers, one or more hot water heaters, one or more washing machines, one or more dishwashers, one or more kitchen faucets, one or more bathroom faucets, one or more toilets, one or more refrigerator water dispensers or ice makers, a Jacuzzi water supply, a pool water supply, and a water fountain supply that communicates using wireless technology with said base station.

39. A residential or commercial building or structure water meter system as recited in claim 35, further comprising a water use calibration mode that uses water flow rate data, water duration data, and total water volume data for learning the patterns and signatures of water use devices, fixtures, and appliances within a home, building, or structure.

40. A residential or commercial building or structure water meter system as recited in claim 35, further comprising an automatic learning mode having learning software that tracks an owner's water flow rate, water duration, and

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total volume use and assigns water patterns and water signatures to the water use device, fixture, or appliance.

41. A residential or commercial building or structure water meter system as recited in claim 35, wherein said cell phone or smart phone, or one or more other electronic communication devices utilize geo-fencing technology to notify a user that they have traveled beyond a defined geo-fence territory and provides the user an option to turn on and off the main water supply.

42. A residential or commercial building or structure water meter system as recited in claim 35, wherein said water control valve mechanism, said variable water flow mechanism, or said three-way valve mechanism is controlled by programming instructions from at least one of CPU, microprocessor, and microcontroller for turning on and off said water control valve mechanism or setting said variable water flow mechanism or said three way valve mechanism.

43. A residential or commercial building or structure water meter system as recited in claim 35, wherein transferring of at least one of a water use data, water energy use data, and water quality data is designed to be incorporated into or in cooperation with electric and gas smart meters communication with mesh technology.

44. A residential or commercial building or structure water meter system as recited in claim 35, wherein the water quality data can be generated by monitoring at least one of a halogen sensor, a total dissolved solids sensor, a metallic sensor, a biological or coliform sensor, a pH sensor, and a water hardness sensor.

45. A residential or commercial building or structure water meter system as recited in claim 35, wherein the base station can be incorporated into or also serve as a pressure regulator at a residential home or commercial facility.

46. A residential or commercial building or structure water meter system as recited in claim 35, further comprising a water flow generation apparatus that can be utilized with one or more rechargeable batteries supplemented with electrical energy generated by a turbine or other water flow type electrical generation technology in hydraulic connection with said water supply source for powering the base unit.

47. A residential or commercial building or structure water meter system as recited in claim 35, wherein a single flow rate sensor monitors and detects the water source use for at least one of a main water supply, one or more irrigation systems, one or more showers, one or more hot water heaters, one or more washing machines, one or more dishwashers, one or more kitchen faucets, one or more bathroom faucets, one or more toilets, one or more refrigerators with water dispensers and ice making supply lines, one or more Jacuzzis, one or more pool water supplies, and one or more water fountains, the base station electrical circuitry has software for recording a unique water pattern or water signature for the water use device, fixture, or appliance.

48. A residential or commercial building or structure water meter system as recited in claim 35, further comprising utilizing an application program interface comprising routines, protocols, and tools for software applications that define software component interactions with graphical user interface, data, networks and registry components.

49. A residential or commercial building or structure water meter system as recited in claim 35, further comprising one or more pressure sensors in electrical connection with said electrical circuitry.

50. A residential or commercial building or structure water meter system as recited in claim 35, further comprising

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prising one or more temperature sensors in electrical connection with said electrical circuitry.

51. A residential or commercial building or structure water meter system as recited in claim 35, further comprising one or more acoustic or sound monitoring sensors in electrical connection with said electrical circuitry, said one or more acoustic or sound monitoring sensors having the capability of at least one of identifying water valves, providing information for water patterns, and identifying leaks.

52. A residential or commercial building or structure water meter system as recited in claim 35, further comprising one or more remote central monitoring computer associated with one or more cloud service centers or private or corporate-owned network allowing registered users to access their recorded water flow data, water energy data, or water quality data on a remote computer using a web-based portal application.

53. A residential or commercial building or structure water meter system comprising:

a base station comprising therein a water control valve mechanism, said base station interposed between a main water line and a water supply for said building or structure water system;

said base station further comprising:

a) an electrical circuitry comprising at least one of a CPU, microprocessor and microcontroller;

b) said power source comprising at least one of an AC power source, DC power source, and one or more standard or rechargeable batteries that are electrically connected to said electrical circuitry;

c) the water control valve mechanism is at least one of an on/off valve, a variable water flow mechanism, or a three-way valve mechanism, the water control mechanism being in electrical communication with said electrical circuitry;

d) one or more water flow rate sensors in communication with said water supply and electrically connected with said electrical circuitry; and

e) one or more wireless communication technologies utilizing confidential communication technology for communication with at least one of a private, commercial, and third-party network and further to a remote central computer or cloud service provider; the confidential communication technology comprising at least one of an encryption, authentication, integrity, and non-repudiation technology which originates from the base station;

a receiving station having a second electrical circuitry including one or more second CPUs or microprocessors that is remotely connected to said base station;

said at least one of a second CPU, microprocessor and microcontroller comprising an integrated memory bank or memory bank located as a separate memory module;

said receiving station is in wired communication with the base station, or having a wireless communication technology corresponding with the one or more wireless communication technologies of the base station;

said receiving station having a second power source that is at least one of an AC power source, DC power source, and powered with one or more batteries being electrically connected to a second circuitry;

the receiving station with the wireless communication technology having the capability of transferring water parameter data utilizing confidential communication technology to at least one of a private, commercial and

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third-party network, and further to a remote central computer or cloud service provider;

at least one of a cell phone or smart phone, computer, web portal, and one or more other electronic communication devices having a user interface utilizing a software program application that facilitates communication between said receiving station and said remote central computer or cloud service provider; and

said program application being configured to provide a user interface capable of displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said receiving station;

wherein said user interface is capable of performing at least one of the functions of:

providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said receiving station memory bank, said remote central computer and the cloud service provider;

turning on or off the water supply by sending a command signal to the receiving station;

showing or modifying a program, setting and a default menu incorporated with the receiving station;

specifying the water control valve mechanism position by sending a request to the receiving station; and

programming a vacation or work water schedule into the receiving station.

54. A residential or commercial building or structure water meter system as recited in claim 53, wherein the one or more other remote electronic communication devices including at least one of a PDA, tablet computer, a smart or Internet capable television, wireless watch and other electronic apparatuses with Wi-Fi and wireless capability.

55. A residential or commercial building or structure water meter system as recited in claim 53, wherein said water control valve mechanism or a variable water flow mechanism is programmed to automatically turn off the main water supply when a leak is detected.

56. A residential or commercial building or structure water meter system as recited in claim 53, wherein said one or more water flow rate sensors includes independent flow sensors with wireless transceivers for at least one of the main water supply, an irrigation water supply, one or more showers, one or more hot water heaters, one or more washing machines, one or more dishwashers, one or more kitchen faucets, one or more bathroom faucets, one or more toilets, one or more refrigerator water dispensers or ice makers, a Jacuzzi water supply, a pool water supply, and a water fountain supply that communicates using wireless technology with said base station.

57. A residential or commercial building or structure water meter system as recited in claim 53, further comprising a water use calibration mode that uses water flow rate data, water duration data, and total water volume data for learning the patterns and signatures of water use devices, fixtures and appliance within a home, building, or structure.

58. A residential or commercial building or structure water meter system as recited in claim 53, further comprising an automatic learning mode having learning software that tracks an owner's water flow rate, water duration, and total volume use and assigns water patterns and water signatures to the water use device, fixture or appliance.

59. A residential or commercial building or structure water meter system as recited in claim 53, wherein said cell phone or smart phone, or one or more other remote elec-

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tronic communication devices utilize geo-fencing technology to notify a user that they have traveled beyond a defined geo-fence territory and provides the user an option to turn on and off the main water supply.

60. A residential or commercial building or structure water meter system as recited in claim 53, wherein said water control valve mechanism, said variable water flow mechanism, or said three-way valve mechanism is controlled by programming instructions from said at least one of CPU, microprocessor, and microcontroller for turning on and off said water control valve mechanism or setting said variable water flow mechanism or said three-way valve mechanism.

61. A residential or commercial building or structure water meter system as recited in claim 53 wherein transferring of at least one of a water use data, water energy use data, and water quality data is designed to be incorporated into or in cooperation with electric and gas smart meters communication with mesh technology.

62. A residential or commercial building or structure water meter system as recited in claim 53, wherein the water quality data can be generated by monitoring at least one of a halogen sensor, a total dissolved solids sensor, a metallic sensor, a biological or coliform sensor, a pH sensor, and a water hardness sensor.

63. A residential or commercial building or structure water meter system as recited in claim 53, wherein the base station can be incorporated into or also serve as a pressure regulator at a residential home or commercial facility.

64. A residential or commercial building or structure water meter system as recited in claim 53, further comprising a water flow generation apparatus that can be utilized with one or more rechargeable batteries supplemented with electrical energy generated by a turbine or other water flow type electrical generation technology in hydraulic connection with said water supply source for powering the base unit.

65. A residential or commercial building or structure water meter system as recited in claim 53, wherein a single flow rate sensor monitors and detects the water source use for at least one of a main water supply, one or more irrigation systems, one or more showers, one or more hot water heaters, one or more washing machines, one or more dishwashers, one or more kitchen faucets, one or more bathroom faucets, one or more toilets, one or more refrigerators with water dispensers and ice making supply lines, one or more Jacuzzis, one or more pool water supplies, and one or more water fountains, the base station electrical circuitry has software for recording a unique water pattern or water signature for the water use device, fixture, or appliance.

66. A residential or commercial building or structure water meter system as recited in claim 53, further comprising utilizing an application program interface comprising routines, protocols, and tools for software applications that define software component interactions with graphical user interface, data, networks and registry components.

67. A residential or commercial building or structure water meter system as recited in claim 53, further comprising one or more pressure sensors in electrical connection with said electrical circuitry.

68. A residential or commercial building or structure water meter system as recited in claim 53, further comprising one or more temperature sensors in electrical connection with said electrical circuitry.

69. A residential or commercial building or structure water meter system as recited in claim 53, further comprising

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missing one or more acoustic or sound monitoring sensors in electrical connection with said electrical circuitry, said one or more acoustic or sound monitoring sensors having the capability of at least one of identifying water valves, providing information for water patterns, and identifying leaks.

70. A residential or commercial building or structure water meter system as recited in claim 53, further comprising one or more remote central monitoring computers associated with one or more cloud service centers or private or corporate-owned network allowing registered users to access their recorded water flow data, water energy data, or water quality data on a remote computer using a web based portal application.

71. A residential or commercial building or structure water meter system as recited in claim 53, further comprising the base station is capable of including mesh-enabled circuitry that can communicate with other base stations or receiving stations for transferring water parameter data or information.

72. A residential or commercial building or structure water meter system as recited in claim 53, further comprising the receiving station is capable of including mesh-enabled circuitry that can communicate with other receiving stations for transferring water parameter data or information.

73. The residential or commercial building or structure water meter of claim 35, wherein at least one of said CPU, microprocessor, and microcontroller can be used to monitor at least one of said water use data, water energy use data, water quality data, generate an alarm state, choose a programming operation for at least setting one of an US or international standard, calibrate sensors, send an alarm for observed leak conditions, utilize geo-fencing technology, transfer data at a defined intervals, enter a water use calibration mode, enter an automatic learning mode, and perform timing procedures.

74. The residential or commercial building or structure water meter of claim 53, wherein at least one of said CPU, microprocessor, and microcontroller can be used to monitor at least one of said water use data, water energy use data, water quality data, generate an alarm state, choose a programming operation for at least setting one of an US or international standard, calibrate sensors, send an alarm for observed leak conditions, utilize geo-fencing technology, transfer data at a defined intervals, enter a water use calibration mode, enter an automatic learning mode, and perform timing procedures.

75. The residential or commercial building or structure water meter of claim 35, wherein the one or more wireless communication technologies is at least one of a cellular technology, Wi-Fi technology, IEEE 802.15.4 format, Zigbee, Z-wave, or Bluetooth technology, a radio frequency in the range of 902 MHz to 928 MHz, and an ISM band in the range of 6.765 MHz to 245 GHz.

76. The residential or commercial building or structure water meter of claim 53, wherein the one or more wireless communication technologies is at least one of a cellular technology, Wi-Fi technology, IEEE 802.15.4 format, Zigbee, Z-wave, Bluetooth technology, a radio frequency in the range of 902 MHz to 928 MHz, and an ISM band in the range of 6.765 MHz to 245 GHz.

77. The residential or commercial building or structure water meter of claim 53, wherein the receiver station is connected via the ethernet or in wireless communication with a router, or includes a wireless communication technology having at least one of a cellular technology, Wi-Fi technology, IEEE 802.15.4 format, Zigbee, Z-wave, Blu-

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etooth technology, a radio frequency in the range of 902 MHz to 928 MHz, and ISM band in the range of 6.765 MHz to 245 GHz to further communicate with at least one of a private, commercial and third-party network and further to a remote offsite central computer or cloud service provider.

78. A residential or commercial building or structure water meter system as recited in claim 35, wherein the base station is able to send an alert signal when a leak is detected to at least one of said cell phone or smart phone, computer, remote computer or one or more other remote electronic communication devices, wherein a user is provided an option to send a command to the base station to control the water control valve mechanism to turn off or on the main water supply.

79. A residential or commercial building or structure water meter system as recited in claim 53, wherein the base station is able to send an alert signal when a leak is detected to at least one of said cell phone or smart phone, computer, remote computer or one or more other remote electronic communication devices, wherein a user is provided an option to send a command to the base station to control the water control valve mechanism to turn off or on the main water supply.

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80. A residential or commercial building or structure water meter system as recited in claim 42, wherein said water control valve mechanism or variable water flow mechanism is capable of being activated by at least one of said smart phone or cell phone, computer, other electronic communication device, remote computer, web portal, and computer serve as sociated with one or more cloud service centers by said one or more wireless communication technologies controlled by a municipality or governmental agency.

81. A residential or commercial building or structure water meter system as recited in claim 60, wherein said water control valve mechanism or variable water flow mechanism is capable of being activated by at least one of said smart phone or cell phone, computer, other electronic communication device, remote computer, web portal, and computer server associated with one or more cloud service centers by said one or more wireless communication technologies controlled by a municipality or governmental agency.

\* \* \* \* \*

(12) **INTER PARTES REVIEW CERTIFICATE** (2086th)

**United States Patent  
Klicpera**

(10) **Number:** **US 9,749,792 K1**  
(45) **Certificate Issued:** **May 14, 2021**

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(54) **WATER USE MONITORING APPARATUS**

(71) **Applicant:** **Michael Edward Klicpera**

(72) **Inventor:** **Michael Edward Klicpera**

(73) **Assignee:** **REIN TECH, INC.**

**Trial Number:**

IPR2020-00100 filed Oct. 29, 2019

**Inter Partes Review Certificate for:**

Patent No.: **9,749,792**  
Issued: **Aug. 29, 2017**  
Appl. No.: **14/596,460**  
Filed: **Jan. 14, 2015**

The results of IPR2020-00100 are reflected in this inter partes review certificate under 35 U.S.C. 318(b).

**INTER PARTES REVIEW CERTIFICATE**

**U.S. Patent 9,749,792 K1**

**Trial No. IPR2020-00100**

**Certificate Issued May 14, 2021**

**1**

**2**

AS A RESULT OF THE INTER PARTES  
REVIEW PROCEEDING, IT HAS BEEN  
DETERMINED THAT:

Claims 1-5, 12, 14, 17, 19, 22, 23 and 27 are cancelled. <sup>5</sup>

\* \* \* \* \*



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www.uspto.gov

Patent No.: 9,749,792 C1  
Issue Date: 01/12/2022  
Appl. No.: 90/014,355  
Filed: 08/05/2019

**PART (A) RESPONSE FOR CERTIFICATES OF CORRECTION**

This is a decision on the Certificate of Correction request filed 27 January 2022.

The request for issuance of Certificate of Correction for the above-identified correction(s) under the provisions of 37 CFR 1.322 and/or 1.323 is hereby:

(Check one)

☒ Approved ☐ Approved in Part ☐ Denied

Comments: \_\_\_\_\_

**PART (B) PETITION UNDER 37 CFR 1.324 OR 37 CFR 1.48**

☐ This is a decision on the petition filed \_\_\_\_\_ to correct inventorship under 37 CFR 1.324.

☐ This is a decision on the request under 37 CFR 1.48, petition filed \_\_\_\_\_. In view of the fact that the patent has already issued, the request under 37 CFR 1.48 has been treated as a petition to correct inventorship under 37 CFR 1.324.

The petition is hereby: ☐ Granted ☐ Dismissed

Comment: \_\_\_\_\_

The patented filed is being forwarded to Certificate of Corrections Branch for issuance of a certificate naming only the actual inventor or inventors.

/MICHAEL FUELLING/  
Supervisory Patent Examiner, Art Unit 3992  
Technology Center 3900  
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,355	08/05/2019	9749792	70965.01	8459
22509	7590	02/01/2022		
MICHAEL E. KLICPERA PO BOX 573 LA JOLLA, CA 92038-0573			EXAMINER RIMELL, SAMUEL G	
			ART UNIT	PAPER NUMBER
			3992	
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			02/01/2022	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 9,749,792 C1

APPLICATION NO.: 14/596,460

ISSUE DATE : August 29, 2017

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 18, line 45, which represents claim 35, line 10, the portion that reads "said power source comprising at least one of an AC" shall read - a power source comprising at least one of an AC -

Column 19, line 48, which represents claim 38, line 4, the portion that reads "sensors with wireless transceivers at least one of the main" shall read - sensors with wireless transceivers or at least one of the main -

Column 21, line 26, which represents independent Claim 53, line 8, the portion that reads "axe electrical circuitry including at least one of a" shall read - an electrical circuitry including at least one of a -

Column 21, line 28, which represents claim 53, line 10, the portion that reads "said power source comprising at least one of an AC" shall read - a power source comprising at least one of an AC -

Column 21, line 51, which represents claim 53, line 33, the portion that reads "microprocessors that is remotely located from said base station;" shall read - microprocessors that is remotely located from said base station; -

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):  
debonair7@att.net

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.